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Cost Analysis of Antihypertensive Therapy in the Hypertensive Patients

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ABSTRACT

Background

Hypertension is an established chronic disease with a huge economic burden to society so choosing cost effective medication is essential. Several medications are available and the decision lies in the prescriber so the generation of evidence suggesting cost-effective medication is essential. The objective of the study was to explore cost effective treatment of hypertension.

Methods

A descriptive cross-sectional study was carried out among hypertensive patients of 20-69 years of age taking antihypertensive medicines for more than one year. Four commonly prescribed drug groups were included: calcium channel blocker, angiotensin receptor blocker, diuretics plus calcium channel blocker, and angiotensin receptor blocker plus calcium channel blocker. The direct medical cost, direct non-medical cost and overall cost of each class of antihypertensive medicine group was estimated as the median cost of that class. The cost-effectiveness relationship was described as a ratio of annual median cost to proportion of patients with controlled hypertension for each pharmacological group.

Results

Angiotensin receptor blocker was the group with lowest annual overall median cost (8915 NPR). Cost effectiveness relationship of calcium channel blocker group was the lowest (10537.83) followed by angiotensin receptor blocker (15115.25) and calcium channel blocker plus angiotensin receptor blocker (21305.69).

Conclusions

Calcium channel blocker was the most cost effective group of antihypertensive drugs. The direct medical costs accounted for high amount of costs for hypertensive patients in all four groups.

Keywords: cost-effective analysis; hypertension; pharmacoeconomics.

INTRODUCTION

Hypertension is defined as a sustained increase in blood pressure (BP) ≥140/90 mm Hg by Joint National Committee.[1] It is the most common condition seen in primary care and leads to myocardial infarction, stroke, renal failure, and death if not detected early and treated appropriately.[2] The cost incurred in the treatment is high as it is a chronic disease so the selection of cost-effective medication is essential. Pharmacoeconomics is a branch of health economics which compares the value of one drug or a drug therapy to another.[3] The studies regarding the cost-analysis of anti-hypertensive therapy are lacking in our context which has created confusion in selecting the cost-effective medication. The study assessing economic burden will be of significance to planners to plan preventive programs and curative approach accordingly. The objective of this study was to derive the cost effective treatment of hypertension. This study also explored the different types of costs incurred in hypertension.

METHODS

This was a cross sectional descriptive study carried out among hypertensive patients of 20-69 years (productive age group) of age in Medicine outpatient

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department of Gandaki Medical College Teaching Hospital, (GMCTH) Pokhara, Nepal. The duration of study was from January 1st, 2019 to December 31st, 2020. This study was ethically approved from Ethical Review Board of Nepal Health Research Council (Ref No. 2475). Verbal consent was taken from the participants and they were voluntarily enrolled in the study. There was no direct harm to the participants. Patients taking AH medicines for one year and more without any co-morbidities were included in study. Patients with cardiovascular complications, diabetes and kidney disease; patients who couldn't recall the expenditure for the treatment for their condition one year back from the time of interview were excluded.

The sample size was calculated from the Cochran's formula, Sample size = $Z^2p(1-p)/d^2$ Where, Z=1.96, p = precision, 50% from previous study,[4] d = 0.16. Putting these values together, the calculated sample size was 37.5. Rounding off, we took 39 samples in each group. The total sample size from the four groups of patients was 156. Convenience sampling was performed to enroll the cases, where all the consecutive cases in the study period, meting the inclusion criteria were included until sample size was obtained for all four groups. The patients on a regular follow up visit for AH therapy were enrolled. We had an initial plan of including first line AH drugs and their combinations in our study but during our data collection period, we only could obtain sample size of four drug groups; calcium channel blocker (CCB), angiotensin receptor blocker (ARB) and their combinations as ARB plus diuretic (D) and CCB plus ARB. A standard pre-tested questionnaire adapted from previous studies[4-8] was used to collect data on demographics, socioeconomics, direct medical and direct non-medical costs by face to face interview. Questionnaire was construct validated by two experts, and pre-tested in 10% of samples unrelated to the study. Cronbach's alpha value obtained was 0.8. The interviewers were trained about the domains of questionnaire and techniques to interview. They were monitored every alternate day by one of the co-investigators of the study. The BP was measured using aneroid sphygmomanometers according to the American Heart Association 2017 guidelines.[9] The patients having systolic BP <140 mmHg and diastolic <90 mm Hg were considered to be having controlled BP for age less than 60 years and BP <150 mmHg and diastolic <90 mm Hg for age at and above 60 years.[10] The trade name of the drug, dose and frequency was determined from the patients' prescription card and generic name was verified from hospital pharmacy. The costs of the AH drug therapies were calculated as a function of the dosage prescribed and prices in list of hospital pharmacy. The investigations ordered by physician were noted from the hospital card. The costs of investigations were determined from the hospital price list. The direct medical costs included costs of drugs, medical supplies, bed charges, consultation fees, laboratory tests and hospital admission. The direct nonmedical cost included extra meals, transportation to and from healthcare facility and miscellaneous costs like extra mattress, utensils, etc. The total expenditure for the last one year for the treatment of hypertension for each class of AH drugs was determined, which was calculated by adding the direct medical and direct nonmedical costs. The data were entered in Microsoft Excel software and analysis done with SPSS 16.0. To check whether data was normally distributed, Kolmogorov Smirnov test was used. As the data were non-normal, median and interquartile range were derived. The direct medical cost, direct non-medical cost and overall cost of each class of AH group was estimated as the median cost of that class. The cost-effectiveness relationship of AH treatment was described on the basis of annual cost. The proportion of participants with controlled BP was calculated for each group. The cost effectiveness relationship (CER)[4] was calculated as a ratio of annual median cost to proportion of patients with controlled hypertension for each pharmacological group (CER = Annual median cost/proportion of controlled hypertension).

RESULTS

A total of 42.9% were females and 57.1% were males. Most of the cases (35.3%) belonged to the age group of 60 to 70 years followed by 50 to 60 years (30.8%). Majority (31.4%) were illiterate followed by acquiring secondary (19.8%) and primary (19.2%) education.

Among the category of occupation of the patients, 31.4 % were doing household jobs followed by professional jobs (27.5%) (Table 1).

Table 1. Socio-demographics of patients. (n=156)

Variables	Female n (%)	Male n (%)
Age group		
18-30	1 (1.5)	2 (2.3)
30-40	2 (2.9)	11 (12.5)
40-50	17 (25.0)	20 (22.7)
50-60	21 (30.8)	27 (30.7)
60-70	27 (39.7)	28 (31.8)
Educational status		
Illiterate	33 (48.6)	16 (18.2)
Primary	13 (19.2)	17 (19.3)
Secondary	15 (22.1)	16 (18.2)
Intermediate	4 (5.9)	10 (11.4)
Bachelors	2 (2.9)	16 (18.2)
Masters	1 (1.5)	13 (14.8)
Occupation		
Household	45 (66.2)	4 (4.5)
Professional job	5 (7.3)	38(43.2)
Retired	8 (11.8)	16 (18.2)
Manual worker	5 (7.3)	17 (19.3)
Business	3 (4.4)	11 (12.5)
Unemployed	2 (2.9)	1 (1.1)
Student	0 (0.0)	1 (1.1)

Table 2 shows median direct medical and direct non-medical costs of CCB, ARB, CCB+ARB, D+ARB groups. The annual median cost, proportion of patients with controlled BP and CER is illustrated in table 3. The annual total median cost was highest for D+ARB group followed by CCB+ARB. The highest proportion of patients with controlled BP were present in CCB group followed by CCB+ARB. The CER of CCB was the lowest one followed by ARB.

Table 3. Cost effectiveness relationship of antihypertensive treatment. (n=156)

Antihypertensive drug group	Annual median cost (Nepalese Rupees)	Proportion of patients with controlled BP	CER= median cost / proportion of patients with controlled BP
CCB (n=39)	8915	0.846	10537.83
ARB (n=39)	8525	0.564	15115.25
CCB+ARB (n=39)	13103	0.615	21305.69
D+ARB (n=39)	18292	0.513	35656.92

CCB: Calcium Channel Blockers, ARB: angiotensin receptor blockers, D: Diuretics, CER: cost effectiveness relationship

DISCUSSION

This study determined the cost effective therapy in hypertension among four groups of AH drugs. These groups are commonly prescribed medications in our hospital. The annual cost of CCB prescribed as monotherapy bared least cost in controlling BP of large number of subjects. This suggested that it was the most cost effective group having lowest cost effectiveness ratio. CCB was followed by ARB, CCB+ARB and D+ARB in cost effective ratio. Hypertension is one of the common non-communicable diseases that is having a lot of economic burden to the world.[11] The direct medical cost of hypertension accounted for highest amount of expenditure in all groups.[12-14] The direct medical cost was high because most of the costs of medicine, laboratory investigations, consultation fees, supplies were spent from out of pocket source of patients. The cost sharing of healthcare through insurance is developed now but still out of pocket sources bears

Table 2. Direct medical and non-medical costs of four groups of antihypertensive drug groups.(n=156)

Antihypertensive drug group	Expense type	Median cost (Nepalese Rupees)	Interquartile range (IQR)
CCB (n=39)	Direct medical	6415	12460-4715
	Direct nonmedical	700	3000-330
ARB (n=39)	Direct medical	7064	11785-5374
	Direct nonmedical	650	3900-120
CCB+ARB (n=39)	Direct medical	11063	15170-8358
	Direct nonmedical	720	4100-180
D+ARB (n=39)	Direct medical	12901	18981-10301
	Direct nonmedical	700	2000-285

CCB: Calcium Channel Blockers, ARB: angiotensin receptor blockers, D: Diuretics

greater cost than insurance.[15] There are four types of full pharmacoeconomic analyses- cost effective, cost benefit, cost minimization and cost utility and two partial analyses- cost of illness and cost consequence. Among these analyses, cost effective analysis is most extensively used. It measures the outcome in non-monetary units like number of lives saved, mmHg of BP lowered, etc. Nowadays, in many countries pharmacoeconomic analyses of newer treatment/procedure is mandatorily performed. After the analysis, if the newer treatment is cost effective then only it is marketed. This analysis is very useful to assess the cost-effective treatment among the various treatments. This helps in reducing the economic burden of the country with the mistreatment and unnecessary treatment. [12-14] Males were more affected with hypertension in our study as in similar other study.[17] The percentage of age group of 60 to 70 years in both genders was higher than all age groups. Hypertension was more prevalent in elderly population worldwide and the same phenomenon was discovered in our study as well. [18] Household jobs and professional jobs hold approximately equal percentage of samples in our study. Patients performing professional jobs need to handle stress of their jobs[19-20] which may play a role in raising the BP. Also, most of the white collar sitting jobs limits movement and exercise. [21] Most patients performing household chores were illiterate who may be less aware of exercises and diet restrictions raising the BP.[22] There are several anti-hypertensive drugs prescribed in hypertension.[2] Clinicians have a tendency to prescribe newer drugs without considering its cost-efficacy, with the assumption that newer drugs are better. But studies have shown, it's not always true.[4-6] Conventional drugs routinely prescribed could work better in terms of efficacy, safety and cost than newer congeners.[23] In a study in India, though diuretics was one of the groups with less percentage (5.55) of prescription as a monotherapy, this group was researched to be most cost effective.[24] Monotherapy was cost effective than polytherapy, the finding corroborating with our study. Our study also paved pathway for prescribing most cost effective medicines like diuretics. Losartan, Telmisartan and Candesartan belonging to ARB group were not included in National List of Essential Medicine (NELM)[25] of our country. Moreover, one of the limitations of choosing drug in NELM is not deriving the cost effective medicine among the available drugs. For instance, for AH treatment, hydrochlorothiazide of diuretic group was included in NLEM but no other diuretics. Losartan which is widely prescribed is not incorporated too and Amlodipine was the recent addition. Drugs in NLEM is not corroborating with prescription pattern by the physician.[26] This study navigated the way forward to revise the AH medications in NLEM. The cost effective alternative will save a lot of budget from out of pocket as well as government sources. Hypertensive medications bear a lot of economic burden to the country as they have to be taken for a long period of time, so it is very essential to prescribe cost effective medicine. The cost effective medicine could be prescribed to the patients which will benefit them financially. Hospitals can incorporate cost effective medicine in its standard treatment protocol. The strength of the study was that it analysed cost effective AH treatment of Nepal which is unique in its kind. The limitation was that samples were not representative of the population. Indirect costs and insurance aspects were not assessed and explored. Recall bias prior to a year could be a possibility.

CONCLUSIONS

Calcium channel blocker was the most cost effective group of AH therapy. The direct medical cost accounted for high amount of cost for hypertensive patients. While prescribing, the most cost effective medicine needs to be prescribed which will financially benefit the patient. It is essential to revise the drug policy and incorporate the inexpensive treatment with better outcome.

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